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PREFABRICATED HOUSING

by

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PREFABRICATED HOUSING

HOME BUILDING, the mass-market industry that has clung most tenaciously to handicraft methods of the pre-industrial age, is at last being converted to mass production and there are many indications that the factory process will become of increasing importance to house construction in the years ahead. Not only is there growing public acceptance of the so-called "prefabricated" house, but factory methods are being successfully adapted to conventional on-site construction. More and more essential parts are being manufactured in finished form for use not only by erectors of factory-built housing but also by regulation builders.

Contrary to earlier expectations, prefabrication has not supplied low-income families with suitable housing at cut prices. But neither has it justified earlier fears that prefabrication would cover the nation's cities and suburbs with unimaginative, flimsy cracker-box dwellings of dull uniformity. On the whole, the factory-built house has the charm, sturdiness, and utility demanded by most families, and its price and quality are roughly comparable with those of houses built piece by piece.

The chief effect to date of the technological revolution in housing has been to raise standards of efficiency, precision engineering, and design in middle-priced homes. At the same time the factory process has helped to hold the price line against inflationary factors, with the result that many features formerly available only in high-priced, custom-built homes are now found in the moderate-to-low price range.

Prefabrication got off to a slow start after World War II, but has taken a marked spurt since 1950. Six years ago only four per cent of the single-family detached dwellings being erected in the United States were factory made. In 1955, the ratio was one in 12; today it is one in 10. The

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production rate is accelerating; the number of prefabricated houses erected last year was 20 per cent larger than in 1954, although the total number of housing starts rose only nine per cent.

The industry expects to turn out 126,000 prefabricated houses this year, with a total selling price of more than \$1¼ billion, compared with 93,000 houses in 1955, 76,000 in 1954, and 37,200 in the first year after the war. By the mid-1960s, when the next great housing boom is expected, spokesmen for the industry predict that it will have captured at least half of the new-house market. In some midwestern communities close to prefabrication plants that ratio has already been attained or exceeded in homes priced below \$15,000.

Prefabrication has begun to move into production of small-scale community buildings, such as churches, school-houses, and dormitories. U.S. Steel Homes is now marketing 15 different church designs, priced from \$15,000 to \$30,000 or about \$10-12 a square foot.¹ At least four other prefabricating firms are also offering church "packages."

Prefabricated public buildings are most frequently used in new residential areas, where speed of construction is desired. Two Maryland communities have contracted for prefabricated school construction to meet pressing needs. A 10-room addition to an elementary school now under way in Wheaton, Md., is planned for start-to-finish completion within a total of 90 days. A new eight-classroom elementary school near Lanham, Md., has a building schedule of slightly less than four months. Many structures of this sort are built with the possibility of future expansion.

EXPANSION OF FACTORIES AND MARKETING AREAS

Until recently, prefabrication was largely a midwestern phenomenon. Because of high transportation costs, it is usually not economically feasible to ship factory-built homes beyond a radius from the plant of 500 miles. An industry survey, conducted by *House and Home*, shows that nearly half of all prefabricated houses built in 1954 and in

¹ A model church displayed by U.S. Steel Homes at the January convention of the National Association of Home Builders in Chicago was bought by the Evangelical Lutheran Synod of Wisconsin. The dismantled parts, weighing 15 tons, were hauled 600 miles to Milwaukee and erected over a pre-built basement. The church, without furniture or religious symbols, cost \$30,000. It has 2,000 square feet of floor space and seats a congregation of 102, taking care of a maximum overflow of 78 by opening steel accordion doors.

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the first nine months of 1955 were produced in Ohio, Indiana, and Illinois.²

The industry has fanned out during the last 12 months. New fabrication plants have sprung up in all parts of the country. Many of them are branch plants of successful midwestern concerns seeking new markets in other regions. A Detroit company has new branch plants in Iowa and New York. National Homes of Lafayette, Ind., largest of the prefabricators, recently invested more than \$1 million in a new plant in Texas. Scholz Homes of Toledo, O., one of the swiftly growing new firms, has established an eastern division in Wilmington, Del., and plans to open another plant in Memphis, Tenn. During 1955-56 several of the larger firms have issued stock for the first time to meet costs of expansion, thus marking the industry's movement into the realm of big business.

House and Home reported that 34 out of 88 firms covered by its 1955 survey planned to build a total of 40 additional plants this year. Thirteen firms planned to expand in the Midwest, eleven in the East, five in the South. Several companies were considering establishment of branch factories in Cuba, Puerto Rico, and South America. Other firms are seeking to widen their markets without opening factories in new localities. One of the oldest prefabricators, Page & Hill, with plants in Iowa and Minnesota, sells its products in 15 states. This year it began shipping houses as far as 850 miles, using its own fleet of specially designed trucks.

With geographic expansion, the larger firms have begun to advertise in magazines of national circulation. As in the automobile and house appliance fields, an effort is being made to develop public confidence in name products. Eventually it is hoped that families will buy houses the way they buy automobiles, selecting a standard model of known quality and design within its price range, and looking to variations in color and trim to escape sameness.

BASIC COMPONENTS OF THE FACTORY-BUILT HOUSE

Components of the prefabricated house are little different from those of the conventionally-built house and the average homeseeker can rarely detect any difference between the two. The basic structure of most prefab houses

² "What's New in Prefabrication?" *House and Home*, December 1955, p. 103.

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is wood and the joining agents are identical with those used by conventional builders. Good prefabricated houses are as sturdy and durable as custom-built houses. Voluntary standards developed by the industry in cooperation with the U.S. Department of Commerce provide for security of joints, weight-bearing strength of parts, adequacy of room space, light, and ventilation.

The essential difference between the two kinds of houses is that much of the work on the prefabricated structure is done in a factory rather than on the site. How much of the house is factory-made depends on the individual manufacturer. There is no established standard for the maximum or minimum number of parts constituting a prefabricated house assembly.

By carrying out much of the construction in the factory, the prefabricator can use large, permanently installed equipment, such as jigs, conveyor belts, and power-driven machinery. Inclement weather does not interrupt the work schedule of the manufacturer or threaten damage to his materials. The producer and the erector can both maintain stable labor forces of experienced specialists. These factors make for a greater degree of efficiency and precision than is normally possible in conventional construction.

The prefabricated house, as it comes off the assembly line, is a collection of house parts, ready for quick assembly; it is almost never a complete structure.³ Ordinarily a crew of four or five men can assemble the parts in a few days. Much of the remaining work, which may take several weeks, can be carried out under shelter.

Exterior walls of many prefabricated dwellings leave the factory with insulation, siding, and interior panels already installed. Characteristically the prefab has a dry wall—of plywood, gypsum board or similar material—rather than a plaster wall. Interior surfaces may need no painting or papering, or they may be factory-primed to require only one coat of finish paint. To satisfy certain local building codes, or to please conservative customers, some walls are prepared for on-site plastering. Touches of brick or stone may be added at the site to give a sturdier appearance, but these add to the cost of the house.

³ One prefabricator in the West produces a completely assembled house, which is trucked to the buyer's lot, ready for occupancy. Such a house can be marketed only where the terrain is flat and the roads wide, straight, and little congested.

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An earlier shortcoming of the factory-built house, the "panelized look" resulting from visible seams between sections, is being overcome. There is nothing structurally wrong with panel construction but it may give the house a flimsy, pieced-together aspect. Prefabricators have learned ways of concealing panel seams and joints. Some use a special tape over seams, others make the seam part of an over-all wall pattern. Open posts and beams along the edges of panels are sometimes used for decorative effect. The handcrafted look of exposed beam construction appeals to buyers who are repelled by the thought of a factory-made home.

FLEXIBILITY OF DESIGN WITH STANDARDIZED UNITS

Because factory methods require a considerable degree of standardization, it was once feared that prefabrication would result in landscapes filled with identical houses. The reverse has been the case. While basic components are standardized in measure and material, they can be adapted to a wide variety of design. Prefabs can be rectangular, or L-, U- or H-shaped. While most are one-story, a large number are two-story structures or follow the popular split-level design.

Switching the location of a carport and using a trussed rather than a flat roof can give a basic assembly several different aspects. The manufacturers produce as large a variety of designs as is feasible with the assembly line process and volume of production. National Homes, the largest prefabricating company, offers 50 basic models, ranging from Cape Cod cottages to ranch houses; with these more than 100 different floor plans and more than 200 different exterior styles and finishes can be used.

Most prefabs can be readily expanded as more living space is needed. A survey sampling of its first 100,000 customers, carried out for National Homes by Elmo Roper, showed that although 90 per cent of the buyers had lived in their factory-built homes only three years or less, 28 per cent had already made substantial additions, such as garages, porches, bedrooms and patios, and more than half planned to do so in the future.⁴ A few manufacturers are already offering add-a-room assemblies.

⁴ Elmo Roper and Associates, *The First 100,000 National Homes Families* (1956), pp. 7, 24.

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Most prefabricated houses are in contemporary style or are modern adaptations of traditional designs. Prefabricators and conventional builders are subject to the same market influences on design and both have found that buyers of new homes want a trim, compact house with a "new look," yet not too extreme. Floor plans usually include an area for outdoor living; kitchens are centrally located so the housewife has easy access to all parts of the house. Many floor plans feature a "family room" as well as a more formal living room; the patio, linked by a glass wall to living or dining room, is a popular feature.

The prefabricator, as a large-scale producer, can afford the services of top-ranking architects to design his "line." Until the factory-built house came along, the modern architect's ideas on design of small houses, suited to contemporary modes of living, had little outlet. The average builder for the middle to low-price market rarely was able to add substantial architects' fees to his already heavy overhead.

The prefabricator gave outstanding architects an opportunity to apply their concepts of small home design to the problems of mass production and many of these proved particularly well suited to the factory process. It is not unusual now to find in middle-priced homes such details, once limited to the custom market, as the cantilever roof, overhanging eaves, sloped windows, indoor-outdoor floor plans, folding wall panels, storage walls, and built-in lighting.

Cost Factors In Factory Process Housing

HISTORICALLY the chief benefit flowing from substitution of factory methods for handicraft methods has been a sharp fall in the price of the finished product. The effect of mass production on the price of automobiles is the most frequently cited case in point. There are many reasons why a comparable development in housing has not yet taken place. While some prefabricated houses are sold at prices below the usual price range of conventionally-built houses, the industry on the whole is a supplier for the middle-income, rather than the low-income family. The survey

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made for National Homes by Elmo Roper showed that the median family income among its customers is \$5,395, compared with the \$4,100 median for all non-farm families.

Prefabricated houses generally sell for \$10,000-\$20,000. The median price of all prefabs marketed in 1955 was \$11,325. A few firms turn out two-bedroom houses which sell for as little as \$6,000 in some localities,⁵ but a growing number are developing the over-\$20,000 market, both anticipating a substantial volume of sales and hoping to raise the prestige of the factory-built house. Several companies will supply a 10-room, three-bath house for \$40,000-\$50,000; one prefabricator (Hodgson Houses) offers structures which range in price from \$10,000 to \$100,000.

The industry itself has done little to date to develop an efficient low-priced house for families in the \$2,000-\$3,000 income group. The house-hungry public after the war showed little interest in a bare utility shelter whose low price was its only attraction. Buyers demanded luxury features, even if that meant larger outlays. The rise in family income, together with easy credit under the government housing program, greatly enlarged the potential market for houses in the \$10,000-\$20,000 class. For this reason the prefabricators made no effort to develop a new market among families at the bottom level of income.

LABOR SAVING ON SITE VS. ADDED COSTS OF HAULAGE

Prefabricators say the home buyer gets more for his money when he chooses a factory-made house instead of a conventionally-built house. Good design and sound construction are more frequently stressed than price advantage. The use of precision machinery, the fact that only best-grade materials can be handled by that machinery, and specialization of the factory labor force are all said to contribute to a higher grade of product. The Prefabricated Home Manufacturers' Institute maintains that the factory process results in a price 10 to 20 per cent lower than would have to be asked for a comparable house built by handicraft methods.

The chief cost-saving factor in prefabrication is the reduction of labor time, both in the plant (by use of auto-

⁵ A Washington concern sells a do-it-yourself package for a three-bedroom house directly to the consumer for \$3,645. The owner-builder must provide his own lot, assembly labor, plumbing, heating, electrical and kitchen equipment, and fixtures at additional cost.

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matic machinery) and on the site (by eliminating piece-by-piece construction). The manufacturer enjoys the advantage of buying his materials in large quantities; his machinery speeds production and virtually eliminates waste.* Operating under shelter, the prefabricator can maintain fixed schedules and year-round production, thus stabilizing production costs.

On the other hand there are important new costs connected with factory production. First there is capital investment in plant and equipment, then the relatively high wages paid skilled industrial labor—which may be offset in some degree by automation—and finally the cost of transporting the finished product to the site. The prefabricator either maintains his own fleet of trucks or hires haulers; if he uses the cheaper rail transportation, he must pay for local hauling and for loading and unloading the house parts twice. Another added cost is the overhead and profit of the builder-dealer who erects the house. Relatively few prefabricators sell directly to the customer because they want to be sure that their structures are properly erected.

If the hauling distance is not great, cost-cutting factors may overcome cost-adding factors. If labor is high-paid in a locality, it may be cheaper to order a prefab even from a plant at some distance than to construct on site. If local building codes do not require many adaptations of the factory product, the prefabricator's price advantage may be substantial.

Prefabrication has not yet developed to a point where the price advantages of factory production can be easily demonstrated to prospective buyers. The prefabrication assembly, as delivered, constitutes on the average less than half the total cost of the completed house, not counting land. Site preparation and foundation building absorb one-tenth of the buyer's outlay; installation of plumbing, heating and wiring about 16 per cent; costs of erecting the structure and of various finishing touches will add up to more than 25 per cent in most cases.

House and Home recently commented on the tendency among prefabricators to add more and more parts to their assembly packages, with the promise of reductions in over-

* A multiple saw used in one large prefabrication plant can make 23 different kinds of cuts, preparing a carload of lumber for assembly in two hours.

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all costs. Among the new elements now being included are:

Prefabricated plumbing, said to result in savings of \$75 to \$300 per house, depending on how much of the unit is acceptable under local codes.

Utility core, containing plumbing, wiring, and water heater plus installed bathroom and kitchen fixtures, estimated to cut plumbing and wiring expense by \$350.

Electrical wiring inside wall which permits complete finishing of wall at the factory and eliminates on-site electrical work.

Prefabricated sheets of plastic or ceramic tile, cut to fit around fixtures of bathroom, said to reduce on-site costs \$160 per house.

A new flooring system of laminated oak panels which run the length of the house and can be rapidly installed.

The 100,000th National Homes house, recently displayed to demonstrate the company's new low-priced line, is said to be the most nearly complete package the firm has ever turned out, chiefly because it contains more pre-painted parts and trim. Designed to sell for \$7,500, this three-bedroom house can be completely assembled by a six-man crew working four and a half days. Although the company in recent years has promoted its luxury models, priced up to \$40,000, it expects 40 per cent of its unit sales in 1957 to fall in the new low-priced line.

USE OF PREFABRICATED PARTS BY ON-SITE BUILDERS

The price difference between the prefabricated and the conventionally-built house has been narrowed by adoption of prefabrication methods by on-site builders. While the large, stationary equipment of the factory cannot be matched on the building lot, the builder can introduce specialization of labor, carry out pre-cutting operations, and use assembly-line methods to reduce his costs.

A number of major house parts are now manufactured for use as time-savers for either prefabricator or on-site builder. Various firms specialize in complete window assemblies. Wall panels of numerous kinds, including window walls, are being marketed to the building trades. Prefinished hardwood floor blocks are said to save the average builder a week's work. Complete roof sheathing, with insulation, vapor barrier and outside-inside finish, is available. Home appliance manufacturers produce complete kitchen and utility room units; even fireplace and chimney assemblies are on the market.

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The growing use of plywood has brought economies, without loss of durability and strength, although there is some customer resistance to its lightweight appearance. The Douglas Fir Plywood Association reports that builders estimate savings of \$300 to \$400 per house by using plywood for walls, roofs, and subfloors. Many plywood wall panels have attractive textured surfaces requiring no further finishing.

Research by the Lumber Dealers Research Council, which represents an industry that once regarded prefabrication as a dangerous competitor, resulted in the development of a form of component construction known commercially as Lu-Re-Co. This provides builders with pre-cut lumber in the form of vertical and horizontal wall panels with cut-outs for doors and windows, plus roof framing section. By buying his lumber in this form, the builder with a crew of four or five men can enclose a house frame in less than a day.

Lu-Re-Co has been on the market only two years but is already in use by nearly a thousand builders. The advantages are identical with prefabrication, except that Lu-Re-Co components constitute less of a house than the usual prefabrication package. Lu-Re-Co is said to cut labor time as much as 170 man-hours per house; one builder estimated he saved \$240 in carpenter costs on a \$15,000 house.⁷

In a recent review of cost-cutting methods used in production of low-priced houses, the National Association of Home Builders found that as many builders used some form of prefabrication as used conventional piece-by-piece methods of construction. The economy unit most consistently employed was found to be the pre-cut truss roof: Large numbers of builders cut wall panels and cabinets in their own shops and haul them to the site.⁸

FAVORABLE POSITION OF LARGE-SCALE DEVELOPER

Conventional builders who undertake large-scale real estate developments are in the best position to use factory methods at the site. If they build hundreds or thousands of homes in a single project, they can enjoy many of the cost-cutting advantages of the prefabricator by buying

⁷ Raymon H. Harrell, "Component Construction," *National Association of Home Builders Correlator*, April 1955, p. 176.

⁸ "Construction Methods Cut Costs," *National Association of Home Builders Correlator*, June 1956, p. 89.

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materials in large quantities and organizing their labor forces for efficient production.

The large-scale builder can usually undersell the prefabricator, although his houses may have a more uniform appearance than the factory-built models. Standardization on site for a one-project operation tends to reduce flexibility, and the introduction of variety adds costs without the opportunity to spread those costs over the years. A large percentage of postwar house building has been in large developments, some of which have been made up wholly of prefabricated houses. Most big-scale builders find it more economical, however, to organize their own construction systems.

On the whole, prefabricators are better able to compete with conventional building in the smaller developments. In communities where the house construction business is in the hands of small firms, turning out 10 to 25 houses a year, the prefabricator can usually offer better value for the same price.⁹ Size of the construction project is of greater importance in the effect on final price than whether construction takes place within the shelter of a factory or on site.

Cost of production, however, is not the sole determinant of cost to the buyer. Market conditions in a particular locality have an obvious bearing. If the demand for housing is high relative to supply, the price of all houses—old and new—will be high. The price of the prefabricated house is usually geared to the price of new houses being offered in the locality by conventional builders in much the same way that the price of butter substitutes is linked to that of dairy products. A leading prefabricator recently commented: "The prefabricated house does not bring down the price of other houses in the area . . . the other existing houses . . . set the price level."¹⁰ Prefabricators do not establish fixed selling prices for their dealer-builders; the price of an identical house may vary as much as \$2,000, depending on location.

⁹ Recognition of this limit on the prefabricator's competitive position is implicit in a recent advertisement of a large manufacturer, which states that prefabrication can provide the cost and quality advantages otherwise available only to the 25,000-a-year builder.

¹⁰ James R. Price, address before Savings and Mortgage Conference of American Bankers Association, New York, January 15, 1955.

Industrialized Building: Past, Present, Future

THE BASIC concept of prefabricated housing can be traced far back in history. Some of the early settlers of the American colonies brought house panels from England. During the California Gold Rush, house components were shipped to prospectors from many distant places. Wooden houses, pre-cut in New York at a cost of \$400, were sold in the West for \$5,000 each. Several hundred galvanized metal houses, already fitted with carpets, wallpaper, and water closets, were sent over from Manchester, England.

In 1861 a lumber dealer in the East patented a system of building a house in three hours from a series of standard panels and parts; many of his units were bought for use of the Union Army. A Massachusetts prefabricating company still in business was turning out panelized houses as far back as 1892. The Prefabricated Home Manufacturers' Institute estimates that a quarter of a million houses, more or less prefabricated, had been erected in the United States before the onset of the great depression of the 1930s.

EXPERIMENTATION WITH PREFABS IN DEPRESSION

Until the third decade of this century most prefabricated houses were bought only to meet temporary or emergency needs. Speed of construction and adequacy of shelter were more important than durability, design or purchase price.¹¹ The idea that factory fabrication of houses might solve the long-standing social problem of providing homes for low-income families not able to afford even the cheapest of conventionally-built structures did not take hold until the economic collapse of the early 1930s. The New Deal, with its emphasis on the ill-housed "one-third of a nation," aroused hope that a satisfactory dwelling might some day be mass-produced to sell for no more than \$2,500. Many economists of that period looked to industrialized low-cost housing as the key to economic recovery.

The Federal Housing Administration stimulated the growth of prefabrication by setting standards for con-

¹¹ In the 1920s imaginative architects awakened much interest in the prospect that a new kind of house, utilizing modern materials, might someday be rolling off assembly lines, but their models were such radical departures from prevailing house designs that the public tended to regard them as curiosities rather than livable homes.

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struction of low-cost houses, eligible for government financing, that took the factory product into consideration. Out of 26,000 houses built for low-income agricultural workers by the Farm Security Administration, several hundred were prefabricated.¹² The Tennessee Valley Authority put up demountable houses for its workers.

A number of commercial firms entered the prefabricating field in the 1930s but their operations were hampered by resistance from local builders and labor unions, by the requirements of inflexible building codes, and by the conservatism of mortgage bankers. The industry had not yet developed an efficient method of merchandising its products. Not until 1943 did it create an effective trade organization, the Prefabricated Home Manufacturers' Institute, to bring the virtues of factory-built homes to wide public attention.

The decade of the 1930s was largely an experimental period. Commercial prefabricators tried out new materials and processes; several large corporations, like U.S. Gypsum and U.S. Steel, turned their attention to developing house parts in the hope of creating additional demand for their products. The Forest Products Laboratory of the U.S. Department of Agriculture and several non-profit research agencies experimented with materials and refinements in construction methods. By 1940 the industry had much of the know-how needed to produce a satisfactory house but still had not found a large market. During the war, a pressing need for emergency housing developed and Washington turned its attention to prefabrication, offering the industry both technical aid and credit.

Of the 1.6 million dwellings built to shelter war workers and military personnel during World War II, 200,000 were prefabricated. Hurried construction and the shortage of good materials combined to produce colonies of highly unattractive dwellings. Temporary prefabs, many of which continued in use after the war, did much to alienate the home-buying public. As one housing expert put it, the public before the war thought of the prefab as a "freak," after the war as a "dreary shack."¹³

¹² A five-room sharecropper house of that period, assembled from prefabricated walls and roof sections, was built at a cost of about \$1,100.

¹³ The climate of public disfavor was shown by results of a poll taken in 1944 by the Curtis Publishing Co. While three-fourths of the persons questioned had heard of prefabricated houses, only 17 per cent of this group said they would consider buying a factory-built house for a year-round home.

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In the early postwar period, public confidence in prefabrication was further shaken by the spectacular failure of the Lustron Corporation. The plan of this company to produce 100 steel homes a day came to an inglorious end when the Reconstruction Finance Corporation in 1950 foreclosed on its \$37.5 million mortgage. The Lustron enterprise represented a radical departure from conventional home building; the company's plant contained equipment such as welding machines and enamel-baking ovens which had no part in normal house construction. Lustron had tried to produce for a mass market before a mass market existed.

NEW SYSTEM OF MARKETING THROUGH DEALER-BUILDERS

During recent years the prefabrication industry has progressed by moving cautiously. It has not tried to impose extreme departures in design upon the public; innovations are introduced on a limited scale to test public acceptance. The industry has expanded from region to region; it has not attempted to blanket the country with prefabrication in a short period. Of most importance, the manufacturers have found an effective method of merchandising their houses through establishment of local dealerships.

There are now more than 6,000 prefabricated housing dealers or dealer-builders in the United States and the number is growing rapidly; more than 1,000 joined the force last year. Trade publications carry advertisements addressed to young, aggressive businessmen with realty or construction experience which point out the advantages of dealing in prefabricated houses. Many of the advertisements are directed to local house builders, suggesting that they switch from the relatively hazardous business of building on speculation to the safer enterprise of taking orders for a known product.

Many advantages of a dealership over speculative building are cited by the manufacturers. Those who become dealer-builders are relieved of the responsibilities and uncertainties of on-site construction; they need less capital; they get quicker returns on their investment;¹⁴ they are assured of a steady year-round supply of houses; they suffer no loss from waste of materials and need not hire

¹⁴ National Homes says it can raise the productivity of a builder's capital by at least 500 per cent because he can erect and sell many more of its units in a given period than he could possibly build himself.

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architects or engineers; they have access without cost to the services of the prefabricator's staff of experts. The dealer is helped on advertising, site preparation, placement of houses on lots, color styling, getting credit, and processing government or private loans. Several of the larger prefabricators have set up their own acceptance corporations which extend loans to dealers and sell mortgages to banks or insurance companies.

LOWERING OF OBSTACLES TO PREFABRICATED HOUSES

Many of the earlier obstacles to growth of the prefabrication industry have fallen away. Building codes containing dimensional and materials requirements that could not be met by prefabrication have been amended in terms of performance, to accommodate not only the prefabricator but the efficient on-site builder.

The problem of producing houses to satisfy the many local and regional codes has been handled by the manufacturers in a practical way. They found that code restrictions in many areas were largely the result of interpretations by building inspectors, who frequently are allowed considerable discretion in applying code terms to new construction in their areas. The job, then, was not so much to seek formal revision of code language as to convince the building inspector that a prefabricated house could meet all the principles of durability, safety and livability on which the code was based. Prefabrication agents usually visit the building inspector in a new market area to explain the technicalities and merits of factory construction.

The earlier difficulty of finding mortgage capital for prefabricated housing has been largely eliminated. Acceptance of factory houses for government mortgage insurance had much to do with breaking down the resistance of private bankers. A good prefabricated house can win Federal Housing Administration or Veterans Administration approval as readily as any other good house; most prefabs being purchased today are covered by government loan insurance.

A mortgage banker recently noted that prefabricated houses began to reach a wide mortgage market two years ago when the supply of mortgage funds temporarily exceeded available outlets. "Investors began accepting pre-

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fabricated homes they otherwise would have turned down, just to keep their portfolios filled. Today they are taking them by choice." The change was attributed to the "keen and growing competition in the prefabricated homes industry, which has brought more diversified styles and better developed houses."¹⁵

Resistance of the strong building trades unions to prefabrication declined as a result of the abundance of jobs over a long period, the growth of factory employment for union labor in prefabricating plants, and the sheer force of the general trend toward labor saving through automation.

Labor's tendency to obstruct change has been curbed by technology itself. Subtle competitive forces are at work. Entire trades can be bypassed in design. . . . Specifications can skirt areas where labor causes trouble. . . . Where labor resists technological innovations, countervailing substitutes allow its resistance to be curbed by some alternative building material or method.¹⁶

The resistance of a plasterer's local to use of spray guns disappeared after wall panels requiring no plastering were substituted on a large number of new house construction jobs. Fears of local lumber dealers that prefabrication would take away their local building customers were allayed by development of the Lu-Re-Co system of pre-cutting structural materials.

A recent review of the construction labor situation in *Architectural Forum* states: "By the mid-50s absolute prohibition of power tools [by labor unions] was rare. . . . It is almost impossible to point to any substantial resistance to new building methods or materials on labor's part. Whether this be attributed to prosperity and full employment, to gains in stabilization or to labor's organizational maturity, it is an undoubted fact."

OUTLOOK FOR GREATER INDUSTRIALIZATION OF HOUSING

The present degree of industrialization in housing appears to be no more than a beginning; eventual effects on construction's role in the national economy and on the extent of home ownership are yet to be determined. Prefabrication has expanded in a period when the productivity of

¹⁵ Robert H. Wilson, "Prefabricated Homes Are Gaining Favor Among Mortgage Lenders," *FF-The Magazine of Prefabrication*, November 1955, p. 38.

¹⁶ Frederick Guthrie, "The Labor Force," *Architectural Forum*, May 1956, p. 116.

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construction labor has been greatly stepped up¹⁷ and when the building trades are becoming more and more stabilized on a year-round basis of operation.

Industrialization of housing has had considerable effect on the composition of the construction labor force itself. Newcomers are rarely the craftsmen of the past; they have limited, specialized skills suited to the particular tasks they perform. Frederick Gutheim pointed out in the *Architectural Forum* that while architects today may long for the old-time craftsmen, they design with an eye to cutting labor costs by use of the machine.

Pre-industrial craftsmanship worked with organic materials. Much of its skill lay in the selection or rejection of stones or pieces of wood, the handling of the material to make it fit the craftsman's purpose. But it is a separate world from building today. Craftsmanship today is tintured with efficiency. . . . It is in the skills of assembly, of . . . machine handling.¹⁸

As labor unions continue to accept the changing skill requirements of their trades, the surge toward greater industrialization of construction will gain momentum. With the public's discovery that industrial methods can do as much for housing as for other large consumer products, and persistent search by the prefabrication industry for more efficient methods and materials, the quality of small homes should rise and their cost should decline.

Whether this will lead to dominance in housing by a few large corporations, or whether housing factories of the future will serve only as sub-assembly plants for local builders, remains to be seen. Noting the increasing difficulty of drawing a line between prefabrication and conventional building, one authority has suggested that "In the end, the prefabrication of homes may well prove to have been only a localized advance, a specialized movement, in the general process of housing industrialization."¹⁹

¹⁷ The size of the building labor force has increased 12 per cent in the past five years, while building output increased 26 per cent.

¹⁸ Gutheim, *op. cit.*, p. 117.

¹⁹ Burnham Kelly, *The Prefabrication of Houses* (1951), p. 99.



